

## Résumé de thèse

### Fish biodiversity changes in Mediterranean Sea: Cases of study, by Ernesto AZZURRO (1).

Ph.D. thesis in Marine Biology and Ecology, 2006, Università Politecnica delle Marche (Italy), 238 p., 43 figs, 35 tabs, 661 refs (in Italian).

It is generally accepted that Mediterranean biodiversity is undergoing rapid changes, with an increase of the number of “warm water” species. Non indigenous species are deeply involved in this process and their incoming represents an unpredictable perturbation for local communities. The present investigation faces this topic by examining some case studies. New documented species in the Strait of Sicily were two Indo-Pacific fish, which migrated through the Suez Channel, the rabbitfish *Siganus luridus* and the bluespotted cornetfish *Fistularia commersonii*. Moreover, a circumtropical species, the Whao *Acanthocybium solandri*, recorded just once in the Mediterranean, was found in the Straits of Messina. Such new records were reported and described in Chapter 2, according to scientific standards.

Chapter 3 offers a detailed update of *Siganus* and *Fistularia* occurrences in the Mediterranean. Published and unpublished information were organized to reconstruct the history of invasion and to re-draw updated distribution maps. Overall, 45 records of *S. luridus* and 36 of *F. commersonii* were reviewed and discussed, with special focus on the central Mediterranean area.

Information on the initial stages of dispersal and settlement are of great interest in understanding the dynamics of biological invasions and in designing management responses. A newly settled population of *S. luridus*, that arrived in Linosa Island (Sicily Strait) in 2000, offered a unique opportunity to examine ecological and biological aspects of the early phase of invasion and the starting point to test genetic variation within and between colonist and source populations. In Chapter 4, demographics and dynamic aspects of *S. luridus* were evaluated by using phylogeographic and demographic (coalescent) methods based on DNA sequences of the mitochondrial control region. Sequences from 95 *S. luridus*, 25 *Siganus rivulatus* and one of *Siganus* (Lo) *vulpinus* were used. Samples were collected in one locality in the Red Sea (Eilat) and three localities in the Mediterranean (Israel, Greece and Linosa, Italy). Data showed (for the first time in a Lessepsian migrant) a lowering of the genetic diversity of the invading population (Mediterranean) compared to the parental one (Red Sea). Within the Mediterranean populations, there was no pattern of regional

separation and mitochondrial diversity appeared to be preserved during the Linosa colonization, with no traces of founder events. Such evidence agrees with the idea that Lessepsian migration involves many individuals from its earliest stages.

Chapter 5 examines the reproductive condition of early settled *S. luridus* in the Island of Linosa. Aspects of gonad morphology, fecundity, atresia and oocyte dynamics were investigated by using 43 specimens collected in concomitance with their first record in the Pelagie Islands. Ovarian development was consistent with the group-synchronous type and testicular organization was of unrestricted spermatogonial testis type, with cystic spermatogenesis. Both males and females had reached final stages of gonad maturation. The rates of follicular atresia were moderate and fecundity estimates did not diverge from what was observed in a reference population along the Lebanese coasts. These observations indicated that the early settled rabbitfishes are reproductively active at Linosa and have high invasive potential. The distribution of gonad maturity stages and gonad indices suggested that the reproductive season could be delayed with respect to Levantine populations.

The new invasive phenomenon in Linosa, generates some questions about the ecological interactions among new settled rabbitfishes and the two indigenous Mediterranean fish species, *Sarpa salpa* and *Sparisoma cretense*. In order to determine whether these species are segregated by diet and to estimate resource partitioning during the early phase of colonization, stomach contents analysis was used. Some peculiar characteristics of *S. luridus* diet were a high feeding intensity and a wide trophic spectrum, based on the presence of 37 taxa of benthic macrophytae in the stomachs contents. *Siganus* and *Salpa* showed considerable differences of the diet, with a low trophic overlap and a high degree of dissimilarity. Despite the recent colonization of the Linosa Island, results indicate a high degree of resource partitioning of these species.

Chapter 7 presents a first analysis of the shallow rocky fish community in the Linosa Island by nightly and daily underwater visual census. Results provided information on the composition and structure of local fish assemblages. Additional data regarding the abundance and distribution of *S. luridus* were also presented.

Key words. - *Siganus luridus* - *Fistularia commersonii* - *Acanthocybium solandri* - *Sarpa salpa* - *Sparisoma cretense* - MED - Lessepsian migration - Genetic differentiation - Reproductive condition - Feeding habits - Underwater visual census - Histology - Mitochondrial DNA.

---

(1) ICRAM, Istituto Centrale per la Ricerca Scientifica e Tecnologica Applicata al Mare. Sede di Milazzo, Via dei Mille 44, 98057 Milazzo (ME), ITALY. [eazzurr@tin.it]